CLAIMS

1   1.   A method of guiding a sleep pattern of a sleeper, the method comprising:

2   monitoring at least one physiological characteristic of a sleeper; and

3   generating at least one sensory stimulus to pace the sleeper.

1   2.   The method of claim 1, further comprising:

2   varying the at least one sensory stimulus;

3   comparing the variations in the sensory stimulus to the at least one physiological

4   characteristic of the sleeper;

5   determining if the sensory stimulus is pacing the sleeper.

1   3.   The method of claim 2, further comprising varying the at least one sensory

2   stimulus to lead the sleeper.

1   4.   The method of claim 2, further comprising:

2   varying the at least one sensory stimulus after it is determined that the sensory

3   stimulus is pacing the sleeper;

4   comparing the variations in the sensory stimulus after the sleeper is being paced

5   to the at least one physiological characteristic of the sleeper;

6   determining if the sensory stimulus is leading the sleeper.

1   5.   The method of claim 4, further comprising monitoring the at least one

2   physiological characteristic of the sleeper until it is determined that the sleeper has been

3   successfully led to a destination sleep stage.

1   6.   A method of guiding a sleep pattern of a sleeper, the method comprising:

2   monitoring at least one physiological characteristic of a sleeper indicative of a

3   current sleep stage of the sleeper; and

4   generating a sensory stimulus to lead the sleeper to a sleep stage different from

5   the current sleep stage.

1   7.   The method of claim 6, wherein monitoring the physiological characteristic

2 comprises monitoring at least one of heart rate, blood pressure, brain wave pattern,

3 muscle tension, eye movement, respiration, body temperature, blood flow, blood oxygen

4 level, blood chemistry, noisiness, moisture, body position and body motion.

1   8.   The method of claim 6, further comprising determining which sleep stage the

2 sleeper is in prior to generating the sensory stimulus.

1   9.   The method of claim 6, wherein generating the sensory stimulus comprises

2 generating at least one of an audible sound, a visible light, a vibration, an electric shock,

3 and an environmental adjustment.

1   10.   The method of claim 9, wherein the environmental adjustment comprises at least

2 one of a temperature change, a change in air flow, a change in ambient light, and a

3 change in ambient noise.

1   11.   The method of claim 6, further comprising determining whether the sleeper has

2 moved to the different sleep stage subsequent to generating the sensory stimulus.

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1   12.   The method of claim 6, wherein generating the sensory stimulus to lead the

2 sleeper comprises pacing the sleeper by generating a sensory stimulus in response to each

3 measured change in the physiological characteristic that exceeds a predetermined

4 threshold.

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1   13.   The method of claim 12, wherein generating the sensory stimulus to lead the

2   sleeper further comprises adjusting a characteristic of the sensory stimulus generated.

1   14.   The method of claim 13, wherein adjusting the characteristic of the sensory

2   stimulus generated comprises adjusting the sensory stimulus generation to affect at least

3   one physiological characteristic of the sleeper to lead the sleeper to the different sleep

4   stage subsequent to generating the sensory stimulus.

1   15.   The method of claim 14, further comprising monitoring the physiological

2   characteristic to determine whether generating the sensory stimulus is encouraging the

3   sleeper to enter the different sleep stage.

1   16.   The method of claim 6, wherein generating the sensory stimulus to lead the

2   sleeper comprises generating the sensory stimulus to lead the sleeper from a non-rapid

3   eye movement sleep stage to a rapid eye movement sleep stage.

1   17.   The method of claim 6, further comprising calibrating to the sleeper's sleep

2   pattern by monitoring the physiological characteristic of the sleeper for at least one full

3   sleep cycle prior to generating the sensory stimulus.

1   18.   The method of claim 17, wherein calibrating to the sleeper's sleep pattern further

2   comprises determining at least one physiological characteristic indicative of when the

3   sleeper is changing from one sleep stage to another sleep stage.

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1   19.   The method of claim 6, further comprising indicating a sleep period duration for

2   monitoring the physiological characteristic and generating sensory stimuli throughout the

3   sleep period duration at selected intervals to guide the sleeper through sleep stages so that

4   the sleeper is in a sleep stage near an awake stage of sleep around an end of the sleep

5   period duration.

1   20.   The method of claim 19, wherein generating sensory stimuli throughout the sleep

2   period duration at selected intervals comprises generating sensory stimuli continuously

3   throughout the sleep period duration to guide the sleeper through sleep.

1   21.   The method of claim 6, further comprising generating a sensory stimulus in

2   response to the monitored physiological characteristic of the sleeper to establish a rapport

3   with the sleeper.

1   22.   The method of claim 21, further comprising monitoring the sleeper's response to

2   the sensory stimulus to establish a rapport to determine if the sleeper is pacing with the

3   sensory stimulus.

1   23.   The method of claim 6, further comprising generating a sensory stimulus to pace

2   the sleeper.

1   24.   The method of claim 23, wherein pacing the sleeper comprises pacing the

2   physiological characteristic of the sleeper.

1   25.   The method of claim 6, further comprising establishing a personalized sleeper

2   profile including at least one data reference indicating a sensory stimulus setting for the

3   sleeper and referencing that data reference when generating the sensory stimulus to lead

4   the sleeper.

1   26.   The method of claim 6, wherein the sensory stimulus stimulates the sleeper's

2   touch sense.

1   27.   The method of claim 6, wherein the sensory stimulus stimulates the sleeper's

2   smell sense.

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1 28.   The method of claim 6, wherein the sensory stimulus stimulates the sleeper's
2 sight sense.

1 29.   The method of claim 6, wherein the sensory stimulus stimulates the sleeper's
2 hearing sense.

1 30.   The method of claim 6, wherein the sensory stimulus stimulates the sleeper's taste
2 sense.

1 31.   The method of claim 6, wherein the at least one physiological characteristic
2 monitored is indicative of a sleep stage associated with sleep apnea of the sleeper and the
3 sensory stimulus generated is generated to lead the sleeper to a sleep stage not associated
4 with the sleeper's sleep apnea.

1 32.   The method of claim 6, wherein the at least one physiological characteristic
2 monitored is indicative of a sleep stage associated with sleepwalking by the sleeper and
3 the sensory stimulus generated is generated to lead the sleeper to a sleep stage not
4 associated with the sleeper's sleepwalking.

1 33.   The method of claim 6, wherein the at least one physiological characteristic
2 monitored is indicative of a sleep stage associated with bedwetting by the sleeper and the
3 sensory stimulus generated is generated to lead the sleeper to a sleep stage not associated
4 with the sleeper's bedwetting.

1 34.   The method of claim 6, wherein the at least one physiological characteristic
2 monitored is indicative of a sleep stage associated with nightmares of the sleeper and the
3 sensory stimulus generated is generated to lead the sleeper to a sleep stage not associated
4 with the sleeper's nightmare.

1   35.   The method of claim 6, wherein the at least one physiological characteristic

2   monitored includes at least two physiological characteristics monitored.

1   36.   The method of claim 35, wherein the at least two physiological characteristics

2   monitored include a plurality of physiological characteristics monitored.

1 37. A method of guiding a sleep pattern of a sleeper between NREM and REM sleep,
2 the method comprising:
3   monitoring at least one physiological characteristic of the sleeper indicative of
4   NREM sleep;
5   generating a sensory stimulus having at least one characteristic configured to lead
6   the sleeper to enter REM sleep; and
7   monitoring the physiological characteristic to determine whether the sensory
8   stimulus was effective to lead the sleeper to enter REM sleep.

1 38. The method of claim 37, further comprising:
2   generating a sensory stimulus to pace the sleeper's sleep;
3   leading the sleeper to enter NREM sleep after the sleeper is pacing; and
4   monitoring the physiological characteristic to determine whether the sleeper
5   entered NREM sleep.

1 39. The method of claim 38, further comprising monitoring the sleeper's response to
2 determine if the sleeper is pacing with the sensory stimulus.

1 40. The method of claim 38, wherein pacing the sleeper's sleep comprises pacing the
2 physiological characteristic of the sleeper.

1 41. The method of claim 37, further comprising:
2   determining that a first change in the physiological characteristic of the sleeper is
3   indicative of NREM sleep and that a second change in the physiological
4   characteristic of the sleeper is indicative of the sleeper entering REM
5   sleep; and
6   guiding the sleeper to enter REM sleep from NREM sleep by leading the sleeper
7   to experience the second change in the physiological characteristic
8   indicative of the sleeper entering REM sleep.

1   42.   The method of claim 37, further comprising generating a sensory stimulus in
2   response to the monitored physiological characteristic of the sleeper to establish a rapport
3   with the sleeper.

1   43.   The method of claim 37, further comprising establishing a personalized sleeper
2   profile including at least one data reference indicating a sensory stimulus setting for the
3   sleeper and referencing that data reference when generating the sensory stimulus to lead
4   the sleeper.

1   44.   The method of claim 37, wherein the sensory stimulus stimulates the sleeper's
2   touch sense.

1   45.   The method of claim 37, wherein the sensory stimulus stimulates the sleeper's
2   smell sense.

1   46.   The method of claim 37, wherein the sensory stimulus stimulates the sleeper's
2   sight sense.

1   47.   The method of claim 37, wherein the sensory stimulus stimulates the sleeper's
2   hearing sense.

1   48.   The method of claim 37, wherein the sensory stimulus stimulates the sleeper's
2   taste sense.

1   49.   The method of claim 37, wherein the at least one physiological characteristic
2   monitored includes at least two physiological characteristics monitored.

1   50.   The method of claim 49, wherein the at least two physiological characteristics
2   monitored include a plurality of physiological characteristics monitored.

51. A sleep pattern adjustor comprising:

a physiological characteristic monitor;

a sensory stimulus generator; and

a processor operatively associated with the physiological characteristic monitor and the sensory stimulus generator, the processor configured to receive input from the physiological characteristic monitor indicative of a first sleep stage of a sleeper and provide output to the sensory stimulus generator to cause the sensory stimulus generator to generate at least a first sensory stimulus in response to the input received from the physiological characteristic monitor to lead the sleeper from the first sleep stage to a second sleep stage.

52. The sleep pattern adjustor of claim 51, wherein the physiological characteristic monitor is configured to monitor at least one physiological characteristic of the sleeper, the at least one physiological characteristic comprising at least one of heart rate, blood pressure, brain wave patterns, muscle tension, eye movement, respiration, body temperature, blood flow, blood oxygen level, blood chemistry, noisiness, body position and body motion

53. The sleep pattern adjustor of claim 51, wherein the processor is further configured to pace a sleeper in the one sleep stage by generating at least a second sensory stimulus in response to a measured change in at least one physiological characteristic monitored through the physiological characteristic monitor, and lead the sleeper to the other sleep stage by adjusting a characteristic of the second sensory stimulus generated.

1   54.   The sleep pattern adjustor of claim 53, wherein the processor is further configured

2   to receive feedback through the physiological characteristic monitor indicating whether

3   the sleeper is following the lead to the other sleep stage, and to further adjust the

4   characteristic of the sensory stimulus generated to further cause the sleeper to change to

5   the other sleep stage.

1   55.   The sleep pattern adjustor of claim 51, wherein the sensory stimulus generator is

2   configured to generate at least one of an audible sound, a visible light, a vibration, an

3   electric shock, and an environmental adjustment.

1   56.   The sleep pattern adjustor of claim 55, wherein the environmental adjustment

2   comprises at least one of a temperature change, a change in air flow, a change in ambient

3   light, and a change in ambient noise.

1   57.   The sleep pattern adjustor of claim 51, wherein the processor is configured to lead

2   the sleeper from a non-rapid eye movement sleep stage to a rapid eye movement sleep

3   stage.

1   58.   The sleep pattern adjustor of claim 51, wherein the processor is further configured

2   to calibrate to the sleeper's sleep pattern by monitoring at least one physiological

3   characteristic of the sleeper for at least a portion of a sleep cycle prior to the sensory

4   stimulus generator generating sensory stimuli.

1   59.   The sleep pattern adjustor of claim 58, wherein the processor is further configured

2   to calibrate to the sleeper's sleep pattern by determining at least one physiological

3   characteristic indicative of when the sleeper is changing between sleep stages.

1   60.   The sleep pattern adjustor of claim 51, wherein the processor is further configured

2   to receive an input indicating a sleep period duration for monitoring the physiological

3   characteristic and to generate sensory stimuli throughout the sleep period duration at

4   selected intervals to guide the sleeper through at least the first and second sleep stages so

5   that the sleeper is in a sleep stage near an awake state around an end of the sleep period

6   duration.

1   61.   The sleep pattern adjustor of claim 60, wherein the processor is further configured

2   to generate sensory stimuli continuously throughout the sleep period duration to guide the

3   sleeper through sleep.

1   62.   The sleep pattern adjustor of claim 51, wherein at least one of the physiological

2   characteristic monitor and the sensory stimulus generator communicates with the

3   processor using wireless technology.

1   63.   The sleep pattern adjustor of claim 51, wherein the processor is further configured

2   to generate a sensory stimulus in response to the monitored physiological characteristic of

3   the sleeper to establish a rapport with the sleeper.

1   64.   The sleep pattern adjustor of claim 63, wherein the processor is further configured

2   to monitor the sleeper's response to the sensory stimulus and generate a responsive

3   sensory stimulus to establish a rapport and pace the sleeper with the sensory stimulus.

1   65.   The sleep pattern adjustor of claim 51, wherein the processor is further configured

2   to generate a sensory stimulus to pace at least one physiological characteristic of the

3   sleeper.

1   66.   The sleep pattern adjustor of claim 51, wherein the processor is further configured

2   to generate a sensory stimulus to lead the sleeper to another sleep stage.

1   67.   The sleep pattern adjustor of claim 51, wherein the processor is further configured

2   to reference a personalized sleeper profile for the sleeper and generate sensory stimulus

3   in accordance with the sleeper's personalized sleeper profile.

1   68.   The sleep pattern adjustor of claim 51, wherein the sensory stimulus generator is

2   configured to stimulate the sleeper's touch sense.

1   69.   The sleep pattern adjustor of claim 51, wherein the sensory stimulus generator is

2   configured to stimulate the sleeper's smell sense.

1   70.   The sleep pattern adjustor of claim 51, wherein the sensory stimulus generator is

2   configured to stimulate the sleeper's sight sense.

1   71.   The sleep pattern adjustor of claim 51, wherein the sensory stimulus generator is

2   configured to stimulate the sleeper's hearing sense.

1   72.   The sleep pattern adjustor of claim 51, wherein the sensory stimulus generator is

2   configured to stimulate the sleeper's taste sense.

1   73.   The sleep pattern adjustor of claim 51, wherein the processor is configured to

2   receive input indicative of a sleep stage associated with the sleeper experiencing sleep

3   apnea and provide output to generate sensory stimulus in response to the input received to

4   lead the sleeper to a different sleep stage not associated with the sleeper experiencing

5   sleep apnea.

1   74.   The sleep pattern adjustor of claim 51, wherein the processor is configured to

2   receive input indicative of a sleep stage associated with the sleeper sleepwalking and

3   provide output to generate sensory stimulus in response to the input received to lead the

4   sleeper to a different sleep stage not associated with the sleeper sleepwalking.

1   75.   The sleep pattern adjustor of claim 51, wherein the processor is configured to

2   receive input indicative of a sleep stage associated with the sleeper wetting the bed and

3   provide output to generate sensory stimulus in response to the input received to lead the

4   sleeper to a different sleep stage not associated with the sleeper wetting the bed.

1   76.   The sleep pattern adjustor of claim 51, wherein the processor is configured to

2   receive input indicative of a sleep stage associated with the sleeper having a nightmare

3   and provide output to generate sensory stimulus in response to the input received to lead

4   the sleeper to a different sleep stage not associated with the sleeper having a nightmare.

1   77.   The sleep pattern adjustor of claim 51, wherein the physiological characteristic

2   monitor monitors at least two physiological characteristics.

1   78.   The sleep pattern adjustor of claim 77, wherein the physiological characteristic

2   monitor monitors a plurality of physiological characteristics.

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1   79.   The sleep pattern adjustor of claim 51, wherein the processor is configured to

2   store a personalized sleep profile and generate the sensory stimulus in accordance with

3   data from the personalized sleep profile.

1   80.   The sleep pattern adjustor of claim 79, wherein the personalized sleep profile

2   comprises data indicative of the sleeper's sleep stages and data indicative of the stimuli to

3   which the sleeper responds for pacing and leading the sleeper from the first sleep stage to

4   the second sleep stage.

1   81.   An apparatus for guiding a sleep pattern of a sleeper to change between NREM

2   and REM sleep, the apparatus comprising:

3   a physiological characteristic monitor configured to monitor at least one

4   physiological characteristic of a sleeper;

5   a sensory stimulus generator configured to generate at least one sensory stimulus

6   in response to the physiological characteristic of the sleeper; and

7   a processor operatively associated with the physiological characteristic monitor

8   and the sensory stimulus generator, the processor configured to receive

9   input from the physiological characteristic monitor indicative of a NREM

10   sleep stage, and provide output to the sensory stimulus generator to lead

11   the sleeper to change to a REM sleep stage.

1   82.   The apparatus of claim 81, wherein the processor is further configured to receive

2   input from the physiological characteristic monitor indicative of the REM sleep stage,

3   and provide output to the sensory stimulus generator to lead the sleeper to change to the

4   NREM sleep stage.

1   83.   The apparatus of claim 81, wherein the processor is further configured to

2   determine which physiological characteristic of the sleeper is indicative of the NREM

3   sleep stage and which physiological characteristic of the sleeper is indicative of the

4   sleeper entering the REM sleep stage, and to guide the sleeper to enter the REM sleep

5   stage by causing the sensory stimulus generator to generate the at least one sensory

6   stimulus to lead the sleeper to experience the physiological characteristic indicative of the

7   sleeper entering the REM sleep stage.

1   84.   The apparatus of claim 81, wherein the processor is further configured to calibrate

2   to the sleeper's sleep patterns and to calculate an optimal sleep pattern related to an

3   amount of time remaining in a preselected sleep period duration.

1 85. The apparatus of claim 84, wherein the processor is further configured to guide

2 the sleeper through the optimal sleep pattern by causing the sensory stimulus generator to

3 generate the at least one sensory stimulus responsive to the physiological characteristic of

4 the sleeper to pace the sleeper, adjusting at least one characteristic of the sensory stimulus

5 generated to lead the sleeper, and determine whether the sleeper is following the lead by

6 monitoring the physiological characteristic of the sleeper through the physiological

7 characteristic monitor.

1 86. The apparatus of claim 81, wherein the processor is further configured to

2 reference a personalized sleeper profile for the sleeper and the sensory stimulus generator

3 is configured to generate sensory stimulus in accordance with the sleeper's personalized

4 sleeper profile.

1 87. The apparatus of claim 81, wherein the at least one physiological characteristic

2 monitored includes at least two physiological characteristics monitored.

1 88. The apparatus of claim 87, wherein the at least two physiological characteristics

2 monitored include a plurality of physiological characteristics monitored.

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